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ABSTRACT

This paper reports on models that clarify the meaning of trends in 8th grade smoking in one of America's most rural and least densely populated states. It is based on cross-sectional analysis of data collected in the "Kansas Communities That Care Survey" from 1995 to 1999. The analysis of trends data is presented in table form utilizing techniques commonly applied in epidemiological studies. The results give support to the thesis that gender is not nearly as important in identifying high-risk youth as behaviors and relationships. Attitudes toward violence and the use of drugs by peers are far better predictors of drug use than ethnicity and gender. It suggests that understanding the psychological etiology of adolescent drug abuse and developing programs that prevent the mental deterioration of children will be more effective than drug-specific programs that attack symptoms but leave the underlying disease untouched. (Contains 8 tables and 14 endnotes.) (JDM)

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Trends in Cigarette Use amongst Kansas Eighth Grade Students: *Communities that Care Survey* Results 1995-2000

by
David E. Kingsley

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Trends in Cigarette Use Amongst Kansas Eighth Grade Students: *Communities That Care Survey* Results 1995-2000

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Introduction

The American Public has an avid, as well as, a legitimate interest in the level of adolescent drug use.[1] Citizens understandably want to know if drug abuse is getting worse or better. It is not surprising that studies that report trends are of great interest and receive major attention from journalists and politicians.[2] Certainly, the claim of one writer that "...drug use in Arizona elementary schools had gone up 1,000 % in four years"[3] would catch readers' attention and would be useful for furthering some political agendas.

Articles with a focus on adolescent drug use trends that appear in scholarly journals[4] often report aggregated use levels along with some disaggregation —usually by gender and ethnicity.[5] As opposed to typical aggregated trends, it has been suggested that the analysis of trend data should focus on the important correlates of "troubled student" behavior –cigarette smoking being but one of a cluster of behaviors associated with "problem teens."[6] Some research suggests, for instance, that it is more meaningful to consider drug use over time in relation to the behavior and attitudes of subgroups (peer groups).[7]

The objective of this article is to report models that clarify the meaning of trends in 8th grade smoking in one of American's most rural and least densely populated states. The authors have been guided in their analysis of student survey responses by a theoretical framework derived from studies that focus on the interrelationship of factors that characterize problem students.[8] As Jessor and Jessor[9] concluded from their classic study of youth, "There is a syndrome character to the interrelations among the different adolescent problem behaviors." The author will argue that although it is important to monitor the drug use trends of gender and ethnic groups, these particular factors are not generally of much value in attempts to explain variance in smoking as a dependent variable.

Trends, when reported in an aggregated fashion, can lead the public and policy makers toward conclusions based on common fallacies. The tendency of humans to erroneously generalize about and stereotype a group because of the behaviors of a subset of individuals within the group is commonly manifested in prevention programs that treat all students the same.

Typically, it is reported that a proportion of students in a particular population have indicated some use of a drug. If 20% of 8th grade students in one state indicate current use of cigarettes, it is often easily, but erroneously assumed that each student has approximately a 1 out of 5 chance of being a current smoker. Statistics tend to be reified –perhaps unconsciously—as physical characteristics of the population being measured. There is a tendency to ascribe reified statistical characteristics to individual members of a population.[10]

The same fallacies are likely when trend data is disaggregated by gender and ethnicity. It is possible that a characteristic of the population in the aggregate, is assigned to each and every member of the group, resulting in the fallacy of division."[11] Males as a group may have a higher rate of smoking than females as a group. However, treatment based on gender would probably be misguided. Subgroups of males and females, with common characteristics other than gender, may have equal incidence and prevalence

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rates. Indeed, the author will demonstrate that differences between males and females are practically nonexistent while students' attitudes toward fighting and the cigarette use of their "best friends" are high significant predictors of smoking for students in the 8th grade.

Thorough discussion of the tangle of fallacies that is likely to occur as the result of reporting statistical analyses such as those associated with trend studies is beyond the scope of this article. Nevertheless, the author will present data models that will eliminate erroneous inferences often drawn from aggregated data or from data that has been disaggregated by gender and ethnic group.

Methodology

This retrospective study is primarily based on cross-sectional analysis of data collected in the *Kansas Communities That Care Survey* during 1995 through 1999. Because of the dichotomous nature of the variable of interest, i.e., "smoked or did not smoke in the 30-day period preceding completion of the survey, " logistic regression analysis is a feasible modeling technique.[12] It is appropriate to apply logistic regression techniques in cross-sectional retrospective studies for the purpose of determining odds ratios.[13] The ratio of odds between students with 0 best friends who smoke and students with 1 best friend who smokes, for instance, can be determined from model coefficients.

Relative risk ratios can, however, only be appropriately calculated in follow-up studies in which all independent variables have been specified.[14] This study, being retrospective, does not meet the criteria for determining relative risks for students in the various classifications examined of being "current smokers." Hence, relative risk ratios will not be reported.

Data Analysis & Results

Trend data is typically presented as an aggregated proportion with some disaggregation by gender and ethnicity. The author will demonstrate the value of analyzing trend data by utilizing techniques commonly applied in epidemiological studies. Through modeling CTC responses with logistic regression analysis, it will be shown that gender does not contribute significantly, in most years, to an explanation of the variance in smoking as a dichotomous dependent variable.

Table 1 displays the aggregated trend data for the 5 years on which this study is focused. The large number of students included in the survey—and analysis of data—is apparent from the column labeled "N." It would appear that 8th grade smoking levels in Kansas have fluctuated somewhat during the 5-year period. It cannot be said that an upward or downward trend exists. Data must be collected for several more years before a time series study can be conducted for the purpose of identifying a significant trend.

Year	Percent	N	Lower Confidence Level*	Upper Confidence Level*
1995	15.5	12,618	14.9	16.1
1996	18	8,745	17.2	18.8
1997	21	10,091	20.2	21.8
1998	19.4	9,001	18.6	20.2
1999	17.3	16,775	16.7	17.9

*95 % confidence level

Table 1

It is interesting and perhaps important to compare male and female drug use. From the standpoint of explaining Kansas 8th grade students' cigarette use and applying results to prevention programming, gender is of little use as an explanatory variable. However, variables such as "number of best friends who smoke" and attitude toward "picking a fight with someone" make major contributions to models predicting cigarette smoking.

Table 2 displays odds ratios for male and female cigarette use for the years 1995 through 1999. Although the odds are close to even in all years presented, the trend is toward even odds. Indeed, by 1999 the odds of male to female cigarette use were even.

	1995		1996		1997		1998		1999	
	M	F	M	F	M	F	M	F	M	F
PERCENT USE	16.5	14.5	18.6	17.0	21.0	20.0	19.8	18.8	17.0	17.0
ODDS	.20	.17	.23	.20	.27	.25	.25	.23	.20	.20
ODDS RATIO: MALE TO FEMALE	1.18		1.15		1.08		1.09		1 (EVEN)	

Table 2

Table 3 displays the coefficients from a logistic regression model with gender specified as the independent variable and smoking as the dichotomous dependent variable (coded 0 and 1). The coefficients were significant in 1995 and 1996 but were trending toward non-significance. As the model chi square statistic indicates, gender explained less of the variance in smoking as the years progressed. The low to nonexistent r square is noteworthy.

Year	N	B*	S.E.	Sig	Exp(B)**	R Square
1995	12,358	.16	.05	.002	1.17	.001
1996	8,574	.11	.06	.05	1.12	.000
1997	9,859	.06	.05	.26	1.06	.000
1998	8,825	.07	.05	.22	1.07	.000
1999	16,438	-.028	.04	.49	.97	.000

Table 3

The coefficients in **Table 3** appear to be relatively stable from year to year. It appears some change has occurred in the ratio of male to female smoking but the model with only gender as an independent variable does not enhance an understanding of smoking. R square in logistic regression is roughly the same as r square in ordinary least squares regression.

Students were asked to respond to an item on the CTC worded thusly: "Think of your four best friends, how many of your best friends have smoked cigarettes?" The choices range from 0 to four. Another item to which students responded is worded in the following manner: "How wrong do you think it is for someone your age to pick a fight with someone?" The choices for the fighting items are 1, "very wrong," 2, "wrong," 3, "a little wrong," and 4, "not wrong at all."

Table 4 displays regression coefficients for the different levels of student responses to the number of their best friends who smoke cigarettes. Indicator coding – with the last or highest number of friends who smoke (4) as the reference – was utilized. Hence, the exponentiated coefficients (Exp(B)) pertain to each of the first 4 levels (0, 1, 2, or 3 best friends who smoke) in reference to the last category.

The regression coefficients in logistic regression analysis can be somewhat confusing. They represent the amount of increase or decrease in log odds for each level of the category. For instance, having 0 best friends who smoke is either true or false. If false, it would be 0 and contribute nothing to the analysis since –4.12(0) equals 0. If it is true, it is coded 1 and would, in 1999, change the log odds by –4.12(1). All other levels would be 0 since each category is mutually exclusive.

The 1999 estimated probability that a student with no best friends who smoke will smoke is $\frac{1}{1+e^{-(.42+-4.122)}} = .02$. Note that the constant .42 + the regression coefficient of –4.122 is exponentiated in the denominator. The odds of being a smoker in this category is probability/1-probability or .02/.98=.02. Hence the odds are .02 to 1 that a student with no best friends who smoke will be a smoker.

The estimated probability that an 8th grade student with 4 best friends who smoke is $\left(\frac{1}{1+e^{-(.42)}}\right)$ or .60. Hence, the odds are .60/.40 or 1.5 to 1. The odds ratio between the "no best friends who smoke" category and "4 best friends who smoke" category is 1.5/.02=75. This simply means that students with 4 best friends who smoke are 75 times more likely to smoke than students with no best friends who smoke.

By applying the regression coefficients in the same manner, one will determine that students with 1 best friend who smokes is 6 times more likely to smoke than a student with no best friends who smoke. Odds ratios for all possible categories for 1999 are presented in **Table 4.**

	No Best Friends Smoke				1 Best Friend Smokes				2 Best Friends Smoke			
Yr	B	S.E.	Signif	Exp(B)	B	S.E.	Signif	Exp(B)	B	S.E.	Signif	Exp(B)
1995	-4.3	.10	.000	.014	-2.4	.09	.000	.09	-1.5	.08	.000	.22
1996	4.2	.12	.000	.015	-2.7	.11	.000	.07	-1.4	.09	.000	.25
1997	-3.9	.10	.000	.020	-2.4	.09	.000	.08	-1.4	.08	.000	.24
1998	-4.1	.11	.000	.017	-2.5	.10	.000	.08	-1.7	.09	.000	.19
1999	-4.1	.08	.000	.016	-2.5	.08	.000	.08	-1.6	.07	.000	.20

	3 Best Friends Smoke				Constant			
Yr	B	S.E.	Signif	Exp(B)	B	S.E.	Signif	Exp(B)
1995	-.78	.09	.000	.46	.40	.05	.000	1.5
1996	-.56	.10	.000	.57	.40	.06	.000	1.5
1997	-.79	.09	.000	.46	.45	.05	.000	1.6
1998	-.93	.09	.000	.39	.57	.06	.000	1.8
1999	-.93	.07	.000	.40	.42	.04	.000	1.5

Table 4

The stability of the coefficients from 1995 through 1999 is noteworthy. One could assume from the replication of the results in 5 separate years that the model has been validated. Estimation of population parameters with the model is phenomenally consistent.

Table 5 presents the percentage of recent smoking for groups disaggregated by "attitude toward picking a fight." Regression coefficients for students' attitude toward fighting as the independent variable with recent smoking as the dependent variable are displayed in **Table 6.**

How Wrong Do You Think It Is For Someone Your Age To Pick A Fight								
	Very Wrong		Wrong		A Little Bit Wrong		Not Wrong At All	
	N	% that smoked	N	% that smoked	N	% that smoked	N	% that smoked
1995	4,228	.06	3,565	.09	3,020	.23	1,396	.43
1996	2,761	.06	2,593	.10	2,169	.26	1,052	.51
1997	2,323	.10	3,685	.13	2,902	.28	1,076	.54
1998	2,236	.085	3,285	.12	2,469	.27	830	.57
1999	4,298	.07	6,150	.11	4,500	.25	1,487	.50

Table 5

The obvious relationship between students' attitudes toward aggressive, violent behavior is clear from the data presented in **Table 5.** Regression coefficients for the model with the attitude toward fighting entered as the independent variable and recent smoking as the dependent are presented in **Table 6.**

How Wrong Do You Think It Is For Someone Your Age To Pick A Fight												
	Very Wrong			Wrong			A Little Bit Wrong			Not Wrong At All		
YR	B	S.E.	Sig.	B	S.E.	Sig.	B	S.E.	Sig.	B	S.E.	Sig.
1995	-2.5	.08	.000	-2.0	.08	.000	-.922	.07	.000	-.29	.05	.000
1996	-2.8	.10	.000	-2.2	.09	.000	-1.11	.08	.000	.04	.06	.000
1997	-2.4	.09	.000	-2.1	.08	.000-	-1.12	.07	.000	.18	.06	.000
1998	-2.6	.10	.000	-2.3	.09	.000	-1.28	.08	.000	.27	.07	.000
1999	-2.6	.08	.000	-2.1	.07	.000	-1.10	.06	.000	.001	.05	.000

Table 6

More than half of the students surveyed believe that it is "Very Wrong" or "Wrong" to pick a fight. Students with fairly strong objections to the violence as it is implied in the survey item are at a much lower risk than students who do not feel inclined to condemn fighting. The disturbing trend that can be derived, however, from the data in **Table 5** is the decrease in the proportion of students who thing it is "Very Wrong" to pick a fight. Trend data for smoking by attitudes toward fighting is presented in **Table 7** for the reader's convenience.

Percentage of Students By Category of How Wrong It IS To Pick A Fight					
Year	N	Percentage of Total Sample (N)			
		Very Wrong	Wrong	A Little Bit Wrong	Not Wrong At All
1995	12,209	35	29	25	11
1996	8,575	32	30	25	12
1997	9,986	23	37	29	11
1998	8,820	25	37	28	9
1999	16,435	26	37	27	9

Table 7

In 1999, only 1.7 % of the students who believed fighting to be "Wrong" or "Very Wrong" and had 0 best friends who smoke indicated recent cigarette use. This category of students represented nearly 40% of all Kansas 8th grade students surveyed in 1999. These students appear to be at a very low risk compared to students in many other categories of "friend use" and "fighting attitude." Nearly 20% of the students were in a category in which 40% or more of the students were recent smokers.

Fourteen percent of students surveyed were in a category in which 50% or more of the students were recent smokers. All of these students had 3 or more friends who were smokers while none believed fighting to be "Very Wrong."

Logistic Regression Model- 1999 8th Grade- Kansas Communities That Care						
Variables In The Equation					Model	
Item	B	S.E.	Signif.	Chi-Square*	df	R Square
How Many Best Friends Smoke?			.000	4793.6	7	.427
None	-3.8	.09	.000			
One	-2.3	.08	.000			
Two	-1.4	.07	.000			
Three	-.84	.07	.000			
How Wrong Is It To Pick A Fight?			.000			
Very Wrong	-1.5	.09	.000			
Wrong	-1.2	.08	.000			
A Little Bit Wrong	-.73	.08	.000			
Constant	1.2	.07	.000			

Table 8

Table 8 displays the logistic regression model with recent smoking (no/yes) entered as the dependent variable. Items pertaining to best friends who smoke and attitude toward fighting were entered as predictor variables. Readers should be aware that the constant represents the student with 4 best friends who smoke and a believe that fighting is "Not Wrong at All." Hence, the model predicts that such a student's

probability of being a recent smoker is .77 or that the student would have a 3.3 to 1 odds of being a recent smoker (.77/.23).

A student with 0 best friends who smoke and believe it is very wrong to pick a fight would have a .0163 probability of being a recent smoker. The odds ratio between students with the highest probability of smoking and students with the lowest probability of smoking is 2.3/0.28 or 82 to 1. Simply stated, the model predicts that a student with 4 best friends who smoke and believe that there is nothing wrong with picking a fight is 82 times more likely of being a recent smoker than a student who believes it is very wrong to pick a fight and has no best friends who smoke.

Discussion

Trend studies as reported in scholarly journals and elsewhere can lead to distorted images of the population from which the data were derived. Distortion is due to presentation of aggregated drug use results without proper control for specified variables.

It is important to monitor gender differences. However, results of logistic regression analyses presented in this article will provide support for the thesis that gender is not nearly as important in identifying high risk youth as behaviors and relationships.

Students who are prone to violence and have friends who use a specific drug are also at great risk to use the drug. While the variance in smoking behavior explained by gender is small to nonexistent, peer's smoking and attitudes toward fighting are highly predictive as is indicated by model coefficients and r squares.

The models presented by the authors are evidence that a debate concerning school programming is needed. A large proportion of students have a very low risk of smoking while a small proportion is at a very high risk of cigarette use. Perhaps students with a 50% or greater probability of smoking (approximately 14% of Kansas 8th grade students in 1999) have different needs that students with a 2% probability or less of engaging in the same type of behavior (nearly 40% of all Kansas 8th grade students in 1999).

Is it efficient and effective to implement the same prevention programs for adolescents with extremely low risk of drug abuse as is implemented for adolescents with extremely high risks of substance abuse? When classroom prevention activities are offered to students, time and resources are diverted from academics. If students who will not benefit from the program lose valuable time from the studies of mathematics or other important subjects, their lives may be harmed in a tangible way.

Logistic regression models support the thesis that behaviors symptomatic of "troubled adolescents" are generally present in clusters. Peers' behavior and attitudes toward violence are probably not etiological – causal – in the development of drug use. It is more likely that these variables are all symptoms of an underling psychological malaise. Typical prevention programs, if not needed by low risk students and if not well received by high-risk students, will fail to produce positive results. Students suffering from various degrees of mental disease, will perhaps, be unlikely to seriously consider the information offered in drug prevention education programs

Seemingly simple solutions that are easy to understand such as mandatory drug testing in public schools may not be the most rational solutions. Aside from the economic cost of testing all students regardless of risk, a major derogation of civil liberties and assault on human dignity through invasive testing is an extremely high price to pay in a democracy. Understanding the psychological etiology of adolescent drug abuse and development of programs that prevent the mental deterioration of children will

be more effective than drug-specific programs that attack symptoms while leaving the underlying disease untouched.

Trend data, as analyzed in this article, indicate that the overall incidence of drug use fluctuates but that the impact of risk factors remains fixed over time. When focus is on cigarettes per se, the underlying cause of smoking may be neglected.

The extensive nature of the Kansas study will enhance other attempts to conduct ongoing studies of adolescent risk behaviors. Kansas is, for the most part, a rural sate with some urbanization such as in Wichita and the Kansas City suburbs. The huge representative samples and homogeneity of the population allows for considerable precision in measuring population parameters.

Perhaps the trends observed in other regions or in the nation – as an aggregate – will not be replicated by studies of the Kansas adolescent population. The author has also through extensive data modeling, discovered relationships between variables that provide some guidelines for further epidemiological studies.

In closing, the author believes that appropriate statistical control will sufficiently safeguard against the type of thinking that leads to a distorted view of individuals because of the reporting of an average or a percentage. As has been demonstrated, variables such as attitudes toward violence and use of drugs by peers are far better predictors of drug use than ethnicity and gender –two variables by which drug use data are generally disaggregated. When peer use is controlled, much of the difference between males and females, and between racial groups, disappears or is reduced to a very small level. Most students have a very low risk for cigarette use while some students have a very high risk. This dichotomy may not be properly accentuated when trends are reported.

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